DOCUMENT RESUME

ED 199 073 SE 034 407

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TITLE A Tool for Assessing and Revising Science Curriculum. Revised Edition.
INSTITUTION Iowa State Dept. of Public Instruction, Des Moines.
PUB DATE Feb 80
NOTE 39p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Curriculum Development: *Curriculum Evaluation: *Educational Objectives: *Elementary Secondary Education: *Guidelines: Public Schools: *Science Curriculum: Science Education

ABSTRACT

Jointly developed by the Iowa Department of Public Instruction and a committee of the Iowa Council of Science Supervisors to encourage and aid local schools in assessing their science curriculum on a continuous basis, this document provides: (1) an implementation schedule for conducting a science curriculum assessment and/or revision: (2) a model for assisting schools in developing their science philosophy, goals, and objectives: (3) recommendations for levels at which suggested objectives are introduced, emphasized and maintained: and (4) an instrument for matching local science curriculum needs to available science programs. (Author/CS)

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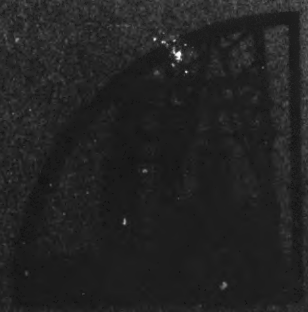
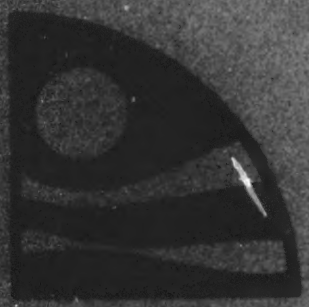
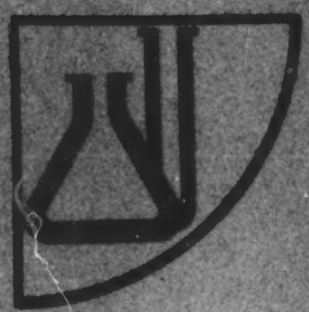


# A Model for ASSESSING and REVISING SCIENCE CURRICULUM





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SE 034 407

4210-D19852-2/80

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# Table of Contents


| | Page |
|---|---|
| Introduction | 1 |
| Implementation Schedule (Summary) | 2 |
| Implementation Schedule | 3 |
| Rationale | 10 |
| Code of Iowa | 11 |
| A Philosophy of Science Education | 12 |
| Goals and Subgoals | 13 |
| Objectives | 14abc-19abc |
| References | 20 |
| Appendix | 21 |

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Some of the material has been either abstracted or quoted directly from the Council of State Science Supervisors ($CS^2$): *The Science Curriculum and the States* (1971) and the *Minnesota Essential Learner Outcomes in Science* (1976).

The Department of Public Instruction would also like to thank the 20 Iowa school districts and approximately 1,000 elementary and secondary teachers of science who assisted in developing and refining this tool during the 1978-79 academic year.

# Introduction

Science education in the nation's schools has undergone some major changes in the last 20 years. The rapidity with which these changes have occurred has made it difficult for schools and teachers to adjust their local science curriculum to changes in students' and society's needs.

This tool was jointly developed by the Iowa Department of Public Instruction (DPI) and a committee of the Iowa Council of Science Supervisors ($CS^2$) to encourage and aid local schools in assessing their science curriculum on a continuous basis. It provides:

- an implementation schedule for conducting a science curriculum assessment and/or revision
- a model for assisting schools in developing their science philosophy, goals, and objectives
- recommendations for levels at which suggested objectives are introduced, emphasized and maintained
- an instrument for matching local science curriculum needs to available science programs

# Implementation Schedule

## (Summary)

| | | Proposed Date |
|---|---|---|
| 1. | Select science curriculum committee | |
| 2. | Schedule time and budget for curriculum work | |
| 3. | Discuss current problems and trends in science education | |
| 4. | Review rationale for science (page 10) | |
| 5. | Review Iowa Code (page 11) | |
| 6. | Develop a philosophy of science teaching: Get feedback from staff and revise (page 12) | |
| 7. | Modify subgoals: Get feedback from staff and revise (page 13) | |
| 8. | Modify objectives: Get feedback from staff and revise (page 14a - 19a) | |
| 9. | Decide on placement of objectives: Get feedback from staff and revise (page 13, 14b - 19b) | |
| 10. | Assess current program: Get feedback from staff and revise (page 13, 14c - 19c) | |
| 11. | Decide on level of revision required | |
| 12. | Assess physical facilities and recommend changes | |
| 13. | Match curriculum needs to available curriculum materials | |
| 14. | Present curriculum materials, under consideration, to staff | |
| 15. | Visit other schools, utilizing materials being considered | |
| 16. | Pilot curriculum materials in select classes | |
| 17. | Notify administration of materials to be selected | |
| 18. | Provide teacher inservice of materials selected | |
| 19. | Evaluate new science curriculum | |
| 20. | Assess student achievement | |
| 21. | Arrange for regular curriculum review | |

# Implementation Schedule

*It is important that <u>all</u> steps contained within this schedule are closely followed in the order in which they appear.*

Proposed Date

## 1. Select Science Curriculum Committee

Establish a science curriculum committee with representatatives from each of these areas:

Administration (principal, assistant superintendent, curriculum coordinator, etc.)

Science teachers K-12 (all buildings represented)

Outside consultant (area education agency, college/ university, DPI, etc.)

Others (counselors, school nurse, lay person, minority representation according to the Code of Iowa 257.25(11), 670-3.5(257), etc.) _____

## 2. Schedule Time And Budget Finances For Curriculum Work

Schedule time and finances during the school year for curriculum planning, development, implementation, and evaluation. _____

## 3. Discuss Current Problems And Trends In Science Education

Arrangements should be made for a knowledgeable consultant to speak with the committee concerning contemporary trends and problems in science education as they relate to the local district. _____

Proposed Data

## 4. Review Rationale For Science

The science curriculum committee should carefully review the Rationale for science (page 10 of this document), and recommended minimum time allotments suggested for science, as they apply to the local district. _____

## 5. Review Iowa Code

The science curriculum should conduct a careful review of the Iowa Code (page 11 of this document) as it applies to the local district. _____

## 6. Develop A Philosophy Of Science Teaching: Feedback And Revision

Using the philosophy statement provided (page 12 of this document), the science curriculum committee should develop a local written philosophy of science specific to local needs. The comprehensive nature of science and its essential purpose in developing scientific literacy in all students should be a major feature of the statement. *The philosophy statement should be duplicated and sent to the entire staff for reactions, additions, deletions, and corrections.* _____

Proposed Data

## 7. Modify Subgoals: Feedback And Revision

The science curriculum committee should modify the subgoals provided in the tool (page 13 of this document) to assure consistency within the local philosophy of science developed in Step No. 6. *The subgoals should then be duplicated and sent to the entire science staff for reactions, additions, deletions, and corrections.*

## 8. Modify Objectives: Feedback And Revision

The science curriculum committee should modify the objectives provided in the tool (pages 14a - 19a of this document). These objectives should represent the ideal curriculum and assure consistency with the goals developed in Step No. 7. Objectives should be added or deleted as appropriate. *At this point, the objectives should be duplicated and sent to the entire science staff for additions, deletions, reactions, and corrections. Teachers written comments, concerning the objectives should be encouraged in the white space provided on the right half of pages* 14a-19a.

Proposed
Data

## 9. Placement Of Objectives: Feedback And Revision

The science curriculum committee should design the program by modifying the placement of the objectives within the K-12 tool provided (pages 13, 14b-19b of this document). *At this point, the suggested modifications should be duplicated and sent to the entire staff for reactions and corrections. Teachers should react to only those objectives which are specific to their teaching assignment. If teachers disagree with the suggested placement of objectives appropriate alterations should be made. Consensus on placement should be reached by the curriculum committee based on suggestions made by the teachers.*

## 10. Assessment Of Current Program: Feedback And Revision

The curriculum committee should have teachers assess the degree to which each objective is emphasized in the present science program using pages 13, 14c-19c of the document. *Each teacher of science should decide the degree to which to objective is emphasized in his/her grade level or course by assessing each objective on the Likert Scale. Appropriate numbers should be circled. Teachers written comments concerning placement of the objectives in their present*

Proposed Data

*science program, should be encouraged in the white space provided on pages* 14c-19c.

## 11. Decide On Level Of Revision Required

If major weaknesses and duplications are identified in the program, the science curriculum committee should recommend a major revision. If only isolated weaknesses are identified, the committee may explore supplements to these areas only. Individual teachers should be encouraged to improve areas of weakness specific to their grade level or course.

## 12. Assess Physical Facilities And Recommend Changes

A thorough assessment of the physical plant and facilities should be conducted, as these may limit the types of programs being considered. (Refer to *Recommended Guidelines for Sites, Facilities, and Equipment* - references)

## 13. Match Curriculum Needs With Available Curriculum Materials

A comparison of local science curriculum needs with those of available programs should be conducted. (Refer to "Matching Local Science Curriculum Needs to Available Science Programs"

Proposed Data

- appendix) Area Education Agency, Department of Public Instruction, college/university consultants and media services may be of assistance. _____

## 14. Present To Science Staff Several Possible Programs

The science curriculum committee should arrange to present to the science staff the two or three programs whose philosophy, goals, and objectives most closely parallel those developed by the local staff. Department of Public Instruction, area education agency, or college/university consultants and commerical sales representatives may provide assistance. _____

## 15. Visit Other Schools

The science curriculum committee should be encouraged to visit a school, of similar size, who is currently utilizing the science materials being considered for adoption. _____

## 16. Pilot Possible Programs - By Selected Teachers

The science curriculum committee should pilot the science materials, proposed for adoption, in one or two classes prior to district adoption. _____

Proposed Data

## 17. Notification To Administration

The science curriculum committee should inform appropriate administrators and/or school board members of the assessment and revision procedures and resultant materials selected. _____

## 18. Provide Inservice For Teachers

The science curriculum committee should arrange for inservice of staff members to encourage effective use of the selected program. _____

## 19. Evaluate Program

In order to assess improvement, the science curriculum committee should evaluate the new science program utilizing the Likert Scale (pages 14c-19c of this document) one year after revision. _____

## 20. Evaluate Students

The science curriculum committee should arrange for regular, appropriate local and state or national, assessment of student achievement. _____

## 21. Periodic Curriculum Review

The science curriculum committee should schedule regular meetings throughout the school year to discuss pros and cons of the new program. _____

# Rationale

Science is an essential ingredient in the total education process. Since we live in a scientific/technological society, science must occupy a place of prominence in the total curriculum.

Science education is the study of the processes of investigation, the knowledge such investigations provide, and the impact and use of such knowledge upon the individual and society. As such, science education should be viewed as a means of assisting with scientific enlightenment - the transmission of useful knowledge and skills.

The science curriculum and staff serve as interpreters of scientific information, theories, and research. As such they serve as the bridge between society (the public) and science (the scientists). They must reflect the nature of science, recent advances in science, and the societal pressures which affect both science and education. They must consider the personal needs of students and the societal issues of the time as they interpret science education in a manner necessary for a citizenry which is scientifically literate.

The science curriculum should be presented in a holistic and integrative manner that is tied to student needs, local situations, and societal issues. It should be experiential, whenever possible, so that students can practice essential skills.

Therefore, every student should receive a sequentially planned science program designed to develop scientific literacy. In addition, we recommend the minimum number of minutes per week allotted to science should be as follows:

K-3: 100 minutes/week
4-6: 150 minutes/week
7-9: 250 minutes or more/week
10-12: 250 minutes or more/week

# Code of Iowa

The *Code of Iowa* provides minimum curriculum requirements and standards for approved schools (K-12).

MULTICULTURAL, NONSEXIST EDUCATION REQUIREMENT (IOWA SCHOOL STANDARDS)

Pursuant to the authority of section 257.25(11) of the Code of Iowa the following are additions to 670-3.5(257).

The curriculum structure and content, instructional materials, and teaching strategies shall reflect the contributions and perspectives of men and women and diverse racial or ethnic groups to the instructional program. Where sex or cultural-racial stereotyping exists in instructional materials, it shall be brought to the attention of the student and supplementary materials should be used to offset the stereotyping. Multicultural, nonsexist instructional materials shall be adopted at the first opportunity. The curriculum shall include activities which promote an awareness of sexism and cultural-racial bias in the English language.
670-3.5(6)

SECTION 257.25 STATES, WHERE APPLICABLE TO SCIENCE:

ELEMENTARY LEVEL

257.25(2) *Kindergarten level.* If a school offers a kindergarten program, the program shall include experiences designed to develop healthy emotional and social habits and growth in the language arts and communication skills, as well as a capacity for the completion of individual tasks, and protection and development of physical being.

257.25(3) *Grades one through six.* The following areas shall be taught in grades one through six:

SCIENCE, including conservation of natural resources and environmental awareness.

JUNIOR HIGH SCHOOL LEVEL

257.25(4) *Grades seven and eight.* The following shall be taught in grades seven and eight as a minimum program:

SCIENCE, including conservation of natural resources and environmental awareness

HIGH SCHOOL LEVEL

257.25(6a through 6j) *Grades nine, ten, eleven and twelve.* The minimum program for grades nine through twelve shall be:

SCIENCE (four units), including physics and chemistry; the units of physics and chemistry may be taught in alternate years

# A Philosophy of Science Education

*The following philosophy was formulated by the DPI/CS² development committee to serve as a guideline in refining local science philosophy (Step No. 6 on the Implementation Schedule).*

Science education is the link between science and society. Its ultimate goal is to DEVELOP SCIENTIFICALLY LITERATE CITIZENS who use and understand the impact, knowledge and processes of science.

The study of science offers a KNOWLEDGE OF NATURAL PHENOMENA that uniquely rests upon the notion that humans can test and understand the orderly nature of the universe. Fundamental to this proposition is a need for students to develop and apply the logical thought PROCESSES OF SCIENCE AS PART OF THEIR BASIC LEARNING. These processes are best developed through a well-articulated science program that includes experimentation and manipulation of materials.

Science activities built upon each individuals natural curiosity become self motivating. This involvement can result in personal gain for students who discover and develop a confidence in their own ability to make decisions that form a basis for COMPREHENDING THE IMPACT of science and technology on the individual, culture and society.

A new generation of scientifically literate citizens is needed to cope with a future characterized by rapid change and a complex set of technical and ethical questions. Accordingly, it is recommended that all students receive an appropriate education in science to develop the intellectual skills that are basic to critical observation, problem resolution, decision-making and valuing.

# Goal and Subgoals

*The following goal and subgoals were formulated by the DPI/CS$^2$ development committee to serve as guidelines in refining local science goals (Step No. 7 on the Implementation Schedule).*

Goal (K-12): 1. To develop a scientfically literate society.

Subgoals (K-12):

A. To apply science processes as a part of basic learning. (Objectives 1-11)

B. To communicate knowledge of natural phenomena. (Objectives 1-29)

C. To use scientific knowledge in comprehending the impact of science and technology on the individual, culture, and society. (Objectives 1-25)

## Objectives

The following objectives, for subgoals A, B, and C, and their suggested placement in the curriculum were formulated by the DPI/CS$^2$ development committee, with suggestions from approximately 1,000 Iowa teachers of science, to serve as guidelines for local science curriculum (Steps No. 8, 9, and 10 on the Implementation Schedule).

Definition of Symbols

Suggested placement of objectives in the science curriculum:

I -- Introduce - The first time a topic is presented as a planned portion of the district science curriculum.

E -- Emphasize - The topic to be stressed.

M -- Maintain - Review and reinforce topics introduced previously.

N -- Not applicable at this level.

Degree to which the objective is emphasized in the science curriculum:

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| None | Very Little | Some | Quite a Bit | A Great Deal |

# Subgoal A

To apply science processes as a part of basic learning.

Process Objectives

1. To develop a student's observing skills. (Observing means using the senses to obtain information or data about objects and events.)

2. To develop a student's classifying skills. (Classifying is the process used to impose order on collections of objects and events to show similarities, differences, and interrelationships.)

3. To develop a student's measuring skills. (Measuring is the process of quantifying observations.)

4. To develop a student's recording skills. (Recording is the process of logical quantification and manipulation of data.)

5. To develop a student's predicting skills. (Predicting is the process of formulating a specific forecast based on observations, measurements and relationships between variables.)

6. To develop a student's inferring skills. (Inferring is the process of using logic to draw conclusions from data.)

# Subgoal A

Process Objectives

7. To develop a student's hypothesizing skills. (Hypothesizing is the process of formulating testable scientific generalizations.)

8. To develop a student's investigating skills. (Investigating is the process of applying logical reasoning to solve new or unique problems.)

9. To develop a student's experimenting skills. (Experimenting is the process of using all the scientific processes in conducting a controlled test of specific scientific hypothesis.)

10. To develop a student's decision-making skills. (Decision-making is the logical process of making a choice from alternatives.)

11. To develop a student's valuing skills. (Valuing is the process of developing a position of commitment for personal actions.)

# Subgoal B

To communicate knowledge of natural phenomena of the universe such as:

Knowledge Objectives

1. Matter/energy relationships.
2. The dynamic universe and solar system.
3. The interaction and interdependence of living things with their environment.
4. That living things are in continuous change.
5. That living organisms are the products of their heredity and environment.
6. That all matter consists of units.
7. The personal aspects of physical, mental and community health and safety.
8. The interaction of people with natural ecological systems.
9. Fundamental organic chemistry.
10. Fundamental inorganic chemistry.
11. The principles of magnetism and electricity.
12. The principles of energy origin, use, and alternatives.
13. The principles of atomic theory.

# Subgoal B

Knowledge Objectives

14. Laboratory equipment, procedures and safety.

15. The periodic table.

16. The principles of continental drift.

17. The principles of mineralogy.

18. The principles of radioactive and physical dating.

19. The principles of geologic record.

20. The importance of the water and other cycles.

21. The conditions influencing weather.

22. Map construction and interpretation.

23. The finite nature of natural resources.

24. The characteristics of living organisms.

25. The cell as the basic unit of living organisms.

26. The essential role of plants to all living things.

27. The principles of human anatomy and physiology.

28. The diversity of living forms.

29. The functioning of simple machines.

# Subgoal C

To use scientific knowledge in comprehending the impact of science and technology on the individual, culture, and society, such as:

Impact Objectives

1. Energy production and usage.
2. Health and well-being.
3. Jobs and careers.
4. Natural resource use and management.
5. All living organisms within populations.
6. Various modes of transportation.
7. Weather modification.
8. Genetic engineering.
9. Chemical development and usage.
10. Design and usage of computers.
11. Methods of communication.
12. The amount, control and usage of pollution.
13. Humankind aesthetically.
14. Living organisms' reaction to stress.
15. Use and/or misuse of drugs.
16. Humankind ethically.

# Subgoal C

Impact Objectives

17. Housing.

18. Food and nutrition.

19. Use and/or misuse of land.

20. Amount and usage of leisure time.

21. Ventures in space.

22. Euthanasia or mercy killing.

23. The ability of species to survive.

24. Artificially induced life.

25. Prosthetics or artificial body parts.

# Subgoal A

To apply science processes as a part of basic learning.

| Process Objectives | Suggested Placement of Process Objectives within Science Curriculum (K-3) | (4-6) | (7-9) | (10-12) |
|---|---|---|---|---|
| 1. To develop a student's observing skills. (Observing means using the senses to obtain information or data about objects and events.) | I | M | M | M |
| 2. To develop a student's classifying skills. (Classifying is the process used to impose order on collections of objects and events to show similarities, differences, and interrelationships.) | I | E | E | E |
| 3. To develop a student's measuring skills. (Measuring is the process of quantifying observations.) | I | E | E | E |
| 4. To develop a student's recording skills. (Recording is the process of logical quantification and manipulation of data.) | I | M | E | E |
| 5. To develop a student's predicting skills. (Predicting is the process of formulating a specific forecast based on observations, measurements and relationships between variables.) | I | E | E | E |
| 6. To develop a student's inferring skills. (Inferring is the process of using logic to draw conclusions from data.) | I | M | E | E |

# Subgoal A

Suggested Placement of Process Objectives within Science Curriculum
(K-3) (4-6) (7-9) (10-12)

Process Objectives

| | | | | | |
|---|---|---|---|---|---|
| 7. | To develop a student's hypothesizing skills. (Hypothesizing is the process of formulating testable scientific generalizations.) | N | I | M | E |
| 8. | To develop a student's investigating skills. (Investigating is the process of applying logical reasoning to solve new or unique problems.) | I | E | E | E |
| 9. | To develop a student's experimenting skills. (Experimenting is the process of using all the scientific processes in conducting a controlled test of a specific scientific hypothesis.) | N | I | M | E |
| 10. | To develop a student's decision-making skills. (Decision-making is the logical process of making a choice from alternatives.) | I | E | M | M |
| 11. | To develop a student's valuing skills. (Valuing is the process of developing a position of commitment for personal actions.) | I | E | M | M |

# Subgoal B

| To communicate knowledge of natural phenomena of the universe, such as: | Suggested Placement of Knowledge Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12) | | | |
|---|---|---|---|---|
| **Knowledge Objectives** | | | | |
| 1. Matter/energy relationships. | I | E | E | E |
| 2. The dynamic universe and solar system. | N | I | E | M |
| 3. The interaction and interdependence of living things with their environment. | I | E | E | M |
| 4. That living things are in continuous change. | I | E | E | E |
| 5. That living organisms are the products of their heredity and environment. | N | I | E | E |
| 6. That all matter consists of units. | I | E | E | E |
| 7. The personal aspects of physical, mental and community health and safety. | I | E | E | E |
| 8. The interaction of people with natural ecological systems. | I | E | E | E |
| 9. Fundamental organic chemistry. | N | N | N | I |
| 10. Fundamental inorganic chemistry. | N | I | E | E |
| 11. The principles of magnetism and electricity. | N | I | E | E |
| 12. The principles of energy origin, use, and alternatives. | I | E | E | E |
| 13. The principles of atomic theory. | N | I | E | E |

# Subgoal B

Knowledge Objectives

| | | Suggested Placement of Knowledge Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12) | | | |
|---|---|---|---|---|---|
| 14. | Laboratory equipment, procedures and safety. | I | E | E | E |
| 15. | The periodic table. | N | N | I | E |
| 16. | The principles of continental drift. | N | N | I | E |
| 17. | The principles of mineralogy. | N | I | E | M |
| 18. | The principles of radioactive and physical dating. | N | N | I | E |
| 19. | The principles of geologic record. | N | I | E | M |
| 20. | The importance of the water and other cycles. | N | I | E | E |
| 21. | The conditions influencing weather. | N | I | E | E |
| 22. | Map construction and interpretation. | N | I | E | E |
| 23. | The finite nature of natural resources. | I | E | E | E |
| 24. | The characteristics of living organisms. | I | M | E | E |
| 25. | The cell as the basic unit of living organisms. | N | I | E | M |
| 26. | The essential role of plants to all living things. | I | M | E | E |
| 27. | The principles of human anatomy and physiology. | N | I | E | E |
| 28. | The diversity of living forms. | I | M | E | E |
| 29. | The functioning of simple machines. | I | M | E | E |

# Subgoal C

To use scientific knowledge in comprehending the impact of science and technology on the individual, culture, and society, such as:

Suggested Placement of Impact Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12)

Impact Objectives

| | | | | | |
|---|---|---|---|---|---|
| 1. | Energy production and usage. | N | I | E | E |
| 2. | Health and well-being. | I | E | E | E |
| 3. | Jobs and careers. | N | I | E | E |
| 4. | Natural resource use and management. | I | E | E | M |
| 5. | All living organisms within populations. | I | E | E | E |
| 6. | Various modes of transportation. | N | I | E | E |
| 7. | Weather modification. | N | I | E | E |
| 8. | Genetic engineering. | N | N | I | E |
| 9. | Chemical development and usage. | N | I | E | E |
| 10. | Design and usage of computers. | N | I | M | E |
| 11. | Methods of communication. | I | M | E | E |
| 12. | The amount, control and usage of pollution. | I | M | E | E |
| 13. | Humankind aesthetically. | I | M | E | E |
| 14. | Living organisms' reaction to stress. | N | I | E | E |
| 15. | Use and/or misuse of drugs. | I | E | E | E |
| 16. | Humankind ethically. | I | E | E | E |

# Subgoal C

| Impact Objectives | Suggested Placement of Impact Objectives within Science Curriculum (K-3) | (4-6) | (7-9) | (10-12) |
|---|---|---|---|---|
| 17. Housing | I | E | E | E |
| 18. Food and nutrition. | I | E | E | E |
| 19. Use and/or misuse of land. | I | E | E | E |
| 20. Amount and usage of leisure time. | I | E | E | E |
| 21. Ventures in space. | N | I | E | M |
| 22. Euthansia or mercy killing. | N | N | I | E |
| 23. The ability of species to survive. | I | E | E | E |
| 24. Artificially induced life. | N | N | I | E |
| 25. Prosthetics or artificial body parts. | N | N | I | E |

# Subgoal A

To apply science processes as a part of basic learning.

Suggested Placement of Process Objectives within Science Curriculum
(K-3) (4-6) (7-9) (10-12)

Degree to Which the Objective Is Emphasized in the Present Science Program(s)
*Write in the Grade Level and Program Being Assessed:*

Process Objectives

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. To develop a student's observing skills. (Observing means using the senses to obtain information or data about objects and events.) | I | M | M | M | 0 | 1 | 2 | 3 | 4 |
| 2. To develop a student's classifying skills. (Classifying is the process used to impose order on collections of objects and events to show similarities, differences, and interrelationships.) | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 3. To develop a student's measuring skills. (Measuring is the process of quantifying observations.) | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 4. To develop a student's recording skills. (Recording is the process of logical quantification and manipulation of data.) | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 5. To develop a student's predicting skills. (Predicting is the process of formulating a specific forecast based on observations, measurements and relationships between variables.) | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 6. To develop a student's inferring skills. (Inferring is the process of using logic to draw conclusions from data.) | I | M | E | E | 0 | 1 | 2 | 3 | 4 |

# Subgoal A

| Process Objectives | Suggested Placement of Process Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12) | | | | Degree to Which the Objective Is Emphasized in the Present Science Program(s) *Write in the Grade Level and Program Being Assessed:* _____ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7. To develop a student's hypothesizing skills. (Hypothesizing is the process of formulating testable scientific generalizations.) | N | I | M | E | 0 | 1 | 2 | 3 | 4 |
| 8. To develop a student's investigating skills. (Investigating is the process of applying logical reasoning to solve new or unique problems.) | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 9. To develop a student's experimenting skills. (Experimenting is the process of using all the scientific processes in conducting a controlled test of a specific scientific hypothesis.) | N | I | M | E | 0 | 1 | 2 | 3 | 4 |
| 10. To develop a student's decision-making skills. (Decision-making is the logical process of making a choice from alternatives.) | I | E | M | M | 0 | 1 | 2 | 3 | 4 |
| 11. To develop a student's valuing skills. (Valuing is the process of developing a position of commitment for personal actions.) | I | E | M | M | 0 | 1 | 2 | 3 | 4 |

# Subgoal B

| To communicate knowledge of natural phenomena of the universe such as: | Suggested Placement of Knowledge Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12) | | | | Degree to Which the Objective Is Emphasized in the Present Science Program(s) *Write in the Grade Level and Program Being Assessed:* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Knowledge Objectives** | | | | | | | | | |
| 1. Matter/energy relationships. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 2. The dynamic universe and solar system. | N | I | E | M | 0 | 1 | 2 | 3 | 4 |
| 3. The interaction and interdependence of living things with their environment. | I | E | E | M | 0 | 1 | 2 | 3 | 4 |
| 4. That living things are in continuous change. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 5. That living organisms are the products of their heredity and environment. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 6. That all matter consists of units. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 7. The personal aspects of physical, mental and community health and safety. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 8. The interaction of people with natural ecological systems. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 9. Fundamental organic chemistry. | N | N | N | I | 0 | 1 | 2 | 3 | 4 |
| 10. Fundamental inorganic chemistry. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 11. The principles of magnetism and electricity. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 12. The principles of energy origin, use, and alternatives. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 13. The principles of atomic theory. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |

## Subgoal B

Knowledge Objectives

| | Suggested Placement of Knowledge Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12) | | | | Degree to Which the Objective Is Emphasized in the Present Science Program(s) *Write in the Grade Level and Program Being Assessed:* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14. Laboratory equipment procedures and safety. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 15. The periodic table. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |
| 16. The principles of continental drift. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |
| 17. The principles of mineralogy. | N | I | E | M | 0 | 1 | 2 | 3 | 4 |
| 18. The principles of radioactive and physical dating. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |
| 19. The principles of geologic record. | N | I | E | M | 0 | 1 | 2 | 3 | 4 |
| 20. The importance of the water and other cycles. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 21. The conditions influencing weather. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 22. Map construction and interpretation. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 23. The finite nature of natural resources. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 24. The characteristics of living organisms. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 25. The cell as the basic unit of living organisms. | N | I | E | M | 0 | 1 | 2 | 3 | 4 |
| 26. The essential role of plants to all living things. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 27. The principles of human anatomy and physiology. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 28. The diversity of living forms. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 29. The functioning of simple machines. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |

# Subgoal C

| To use scientific knowledge in comprehending the impact of science and technology on the individual culture, and society, such as: | Suggested Placement of Impact Objectives within Science Curriculum (K-3) (4-6) (7-9) (10-12) | | | | Degree to Which the Objective Is Emphasized in the Present Science Program(s) *Write in the Grade Level and Program Being Assessed:* _____ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Impact Objectives | | | | | | | | | |
| 1. Energy production and usage. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 2. Health and well-being. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 3. Jobs and careers. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 4. Natural resource use and management. | I | E | E | M | 0 | 1 | 2 | 3 | 4 |
| 5. All living organisms within populations. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 6. Various modes of transportation. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 7. Weather modification. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 8. Genetic engineering. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |
| 9. Chemical development and usage. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 10. Design and usage of computers. | N | I | M | E | 0 | 1 | 2 | 3 | 4 |
| 11. Methods of communication. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 12. The amount, control and usage of pollution. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 13. Humankind aesthetically. | I | M | E | E | 0 | 1 | 2 | 3 | 4 |
| 14. Living organisms' reaction to stress. | N | I | E | E | 0 | 1 | 2 | 3 | 4 |
| 15. Use and/or misuse of drugs. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 16. Humankind ethically. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |

# Subgoal C

| Impact Objectives | Suggested Placement of Impact Objectives within Science Curriculum (K-3) | (4-6) | (7-9) | (10-12) | Degree to Which the Objective Is Emphasized in the Present Science Program(s) *Write in the Grade Level and Program Being Assessed:* _____ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 17. Housing. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 18. Food and nutrition. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 19. Use and/or misuse of land. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 20. Amount and usage of leisure time. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 21. Ventures in space. | N | I | E | M | 0 | 1 | 2 | 3 | 4 |
| 22. Euthansia or mercy killing. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |
| 23. The ability of species to survive. | I | E | E | E | 0 | 1 | 2 | 3 | 4 |
| 24. Artificially induced life. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |
| 25. Prosthetics or artificial body parts. | N | N | I | E | 0 | 1 | 2 | 3 | 4 |

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# Appendix

Grade Level(s), Subject

## MATCHING LOCAL SCIENCE CURRICULUM NEEDS TO AVAILABLE SCIENCE PROGRAMS

Use the following instrument to compare your local science curriculum needs to available programs being considered. *Enter the names of the programs being considered on the diagonal lines at the top of the instrument. Using the Likert Scale below and the criteria on the vertical axis, rate each program by entering the appropriate number in each box.*

0 — Total Disagreement; 1; 2 — General Agreement; 3; 4 — Total Agreement

Science Programs Being Assessed:

| Assessment Criteria | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Philosophy | | | | | | | | | | |
| Goal | | | | | | | | | | |
| Subgoal - Processes<br>Objectives | | | | | | | | | | |
| Subgoal - Knowledge<br>Objectives<br>Life Science<br>Earth Science<br>Physical Science | | | | | | | | | | |
| Subgoal - Impact<br>Objectives | | | | | | | | | | |
| OTHER FACTORS TO CONSIDER | | | | | | | | | | |
| Copyright Date | | | | | | | | | | |
| Student Evaluation Criteria (Behavioral objectives, tests, etc.) | | | | | | | | | | |
| Required Material Availability/ Replacement | | | | | | | | | | |

Science Programs Being Assessed:

| Assessment Criteria | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Natural Resources and Environmental Awareness Concepts | | | | | | | | | | |
| Math Concepts | | | | | | | | | | |
| Health Concepts | | | | | | | | | | |
| Reading Level | | | | | | | | | | |
| Title IX Consistency | | | | | | | | | | |
| Consistent with Multicultural, Nonsexist education requirement (Code of Iowa) 257.25(11) 670-3.5(257) | | | | | | | | | | |
| Cosmetic Appearance | | | | | | | | | | |
| Teacher's Edition (Scope/sequence, alternative teaching strategies, etc.) | | | | | | | | | | |
| Inservice Required | | | | | | | | | | |
| Physical Plant, Facilities Limitations (gas, water, electricity, hardware, etc.) | | | | | | | | | | |
| Supportive Materials Available (audiovisuals, lab manuals, software, etc.) | | | | | | | | | | |
| Career References | | | | | | | | | | |
| Material appropriate to intellectural levels of Students | | | | | | | | | | |
| Program is Sequential and Articulated | | | | | | | | | | |
| Level of Teacher Commitment Required | | | | | | | | | | |
| Integration with Other Science Programs Possible | | | | | | | | | | |
| POINT TOTALS | | | | | | | | | | |